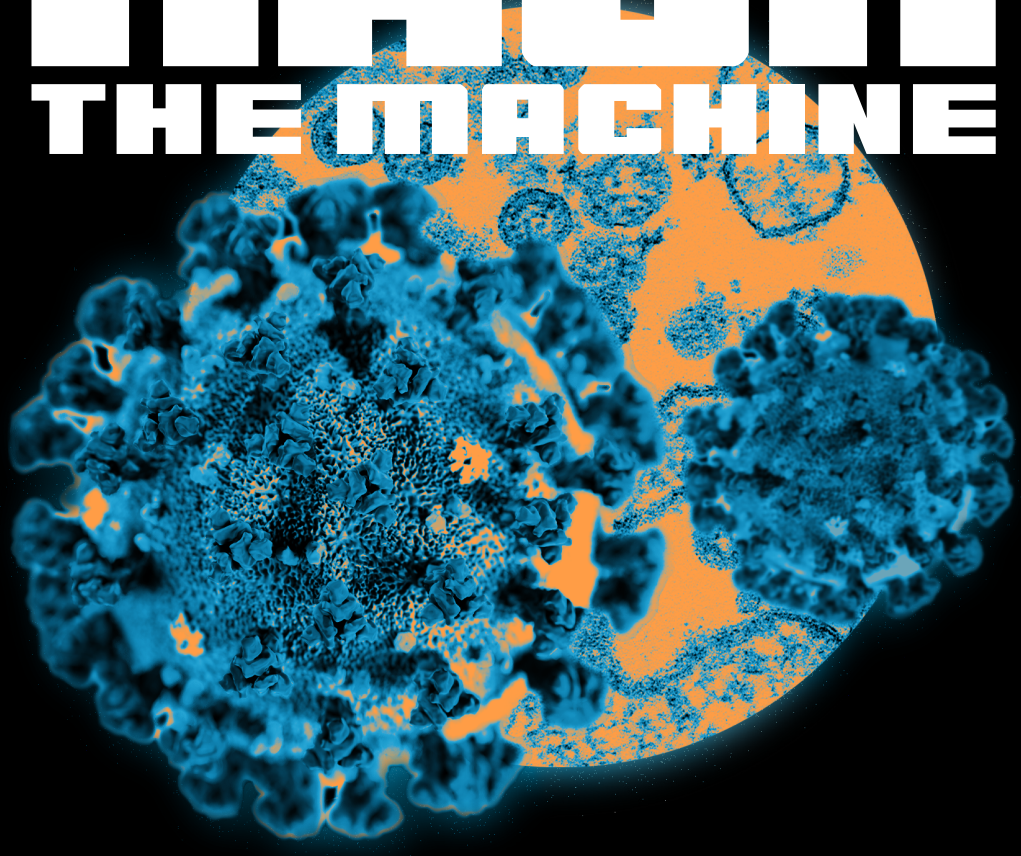
HACK THE MACHINE



Track 2: Data Science

Participation Guide

The Navy's Premier Digital Experience is led by NAVSEA with sponsors and partners across the Navy and industry.

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HACKtheMACHINE

TRACK 2: Data Science - Naturally

This challenge gives you the opportunity to use natural language processing techniques to explore whether an automated system could make a recommendation about how to navigate specific COVID-19 scenarios. You will also have a chance to allocate resources in an unfolding infection scenario on the USS GHOST, a fictional ship, in an attempt to maintain the crew's health and mission readiness.

Prize money:

The team with the highest aggregate score from all three challenges will win the top prize! First prize will be awarded $15,000, second place will be awarded $10,000, and third place will receive $5,000. The challenges are designed to reward both proposed solutions and completed algorithms. Therefore, you are encouraged to be creative. Novelty and creativity are an important factor for scoring these difficult challenges.

Centers for Disease Control (CDC) COVID-19 Data:

You will be provided with a text file of CDC guidelines for the COVID-19 pandemic. You will be expected to train models on this data in order to make recommendation on COVID-19 risk, COVID-19 guidance, and COVID-19 resource allocation.

Example CDC Guidance: *https://www.cdc.gov/coronavirus/2019-ncov/your-health/index.html*

Challenges Intro:

There are three challenges in the data science track. There are two challenges on natural language processing. In the first one, you'll need to identify scenarios on a risk spectrum. In the second challenge, you will modify a set of instructions based on different situations. The final challenge will ask you to allocate resources in the medical bay on the USS GHOST while it is experiencing a COVID-19 outbreak.

These challenges are a game driven first step in the development of decision support tools for handling a pandemic. They do not address the complex AI ethics of such tools in a medical context.

Challenges:

You will be provided with a guide of all recommendations from the CDC on how to minimize the spread of COVID-19. The dataset contains detailed step-by-step instructions for certain situations, general information about the virus, and preventative care measures. Relevant tools may include sentiment analysis, logical relationships in text, deep neural networks, or linear regressions. We encourage you to be as creative and original with your solutions as possible!

CHALLENGE 1: SPECTRUM LABELING

Based on a dataset containing hundreds of recommendations for minimizing the spread of COVID-19, can you correctly apply these guidelines to scenarios and deliver an assessment of danger?

CDC guidelines are designed to help the public understand and navigate the COVID-19 pandemic. In this challenge you will design an algorithm that can label scenarios on a spectrum of risk.

As a starting point, consider looking for guidelines that have direct right or wrong instructions. Examples of this would be wearing a face mask while in public or not attending gatherings where it is not possible to maintain a social distance of more than 6 feet.

Spectrum problems often center around situations where people do not follow the CDC's basic safety. A training list of scenarios will be available to you so that you may tune and improve your algorithms. The spectrum of risk can range from a label of 1 (completely safe) to 6 (extremely dangerous). You will be given a training data set and a test data set. A small amount of leeway will be allowed in scoring for labels that are within a certain margin of error. A validation set will be released 90 minutes before the final deadline to test the efficacy of your algorithms.

The spectrum of risk for this challenge:

Completely Safe (1) ► Mostly Safe (2) ► Moderately Safe (3) ► Ill Advised (4) ► Dangerous (5) ► Extremely Dangerous (6)

Example of a scenario to label:

"A 22-year-old college student would like to go to a beach party with their friends. The party will be in the open air with direct sunlight. Masks are not required. Drinks and food will be provided and served in a shared family meal context. "

The correct label of this situation would be a 3 on the spectrum of safe to dangerous. A correct guess of 3 would be awarded 2 points. A margin of error of 1 point will be allowed for this challenge. If you guessed 2 or 4 you would win 1 point for that scenario.

Grading:

Up to 85 points will be awarded for getting the correct solution to the games along with a comprehensive write up that shows how you arrived at your solution. In order to receive points, the methodology, and algorithms behind your solutions must be provided for evaluation.

Up to 15 points will be awarded by a panel of judges for the creativity of the completed or proposed solution and for ideas about the application of AI ethics that might be necessary to use your solution in real-world scenario.

CHALLENGE 2: DANGEROUS SITUATIONS

Having rules that can help individuals navigate the world in a pandemic is a valuable tool that can prevent unnecessary spread of the virus. This challenge asks you to use the CDC's extensive guidance on COVID-19 to make adverse scenarios easier to navigate. By determining which guidelines to change or eliminate for a specific scenario, we can deliver tailored advice about controlling the spread of the virus at all times.

We are using the CDC's guidelines to modify interactions for adverse scenarios, Found here: https://www.cdc.gov/coronavirus/2019-ncov/your-health/index.html Examples include individuals who suspect they may have COVID-19, a hospital nurse working on a COVID-19 floor, and an individual who has contracted COVID-19 and is self-isolating for the duration of the infection.

Different situations require different actions. What is safe for one person may be disastrous for someone else. Your challenge will be creating a union set of the standing rules and supplemental rules for specific scenarios.

There are two parts to this Challenge:

1. Sort through the CDC's recommendations/general guidance to find the rules that apply to each scenario.

2. Create a union set of the general rules and the rules you found for #1 above. The rules you find in the CDC data will overlap or replace the general rules where possible. You will be assigned points based on your ability to replace and modify the general rules with the rules you have parsed from the CDC data.

Example of a correct modification of general rules with a set of supplemental rules for COVID-19:

"If you are traveling"

General Rules:

- Wear a mask
- Stay 6 feet from others
- Avoid crowds
- Avoid poorly ventilated spaces
- Wash your hands often
- Cover coughs and sneezes
- Clean and disinfect frequently touched surfaces daily
- Monitor your health daily
- Get vaccinated

Rules parsed from the CDC's guidelines for COVID-19 for "If you are traveling":

- If you are eligible, get fully vaccinated for COVID-19. Wait 2 weeks after getting your second vaccine dose to travel—it takes time for your body to build protection after any vaccination.

- Get tested with a viral test 1-3 days before you travel. Keep a copy of your test results with you during travel in case you are asked for them. Do NOT travel if you test positive.
- Check travel restrictions before you go.
- Wear a mask over your nose and mouth when in public settings. Masks are required on planes, buses, trains, and other forms of public transportation traveling into, within, or out of the United States and in U.S. transportation hubs such as airports and stations.
- Avoid crowds and stay at least 6 feet/2 meters (about 2 arm lengths) from anyone who did not travel with you. It's important to do this everywhere — both indoors and outdoors.
- Wash your hands often or use hand sanitizer (with at least 60% alcohol).
- Bring extra supplies, such as masks and hand sanitizer.
- Avoid contact with anyone who is sick.
- Avoid touching your eyes, nose, and mouth.

Merged set of general and CDC rules:

- ~~Wear a mask~~ Wear a mask over your nose and mouth when in public settings. Masks are required on planes, buses, trains, and other forms of public transportation traveling into, within, or out of the United States and in U.S. transportation hubs such as airports and stations.
- ~~Stay 6 feet from others~~ Avoid crowds and stay at least 6 feet/2 meters (about 2 arm lengths) from anyone who did not travel with you. It's important to do this everywhere — both indoors and outdoors.
- ~~Avoid crowds~~ Avoid contact with anyone who is sick.
- Avoid poorly ventilated spaces
- ~~Wash your hands often~~ Wash your hands often or use hand sanitizer (with at least 60% alcohol).
- Cover coughs and sneezes
- Clean and disinfect frequently touched surfaces daily
- Monitor your health daily
- ~~Get vaccinate~~d If you are eligible, get fully vaccinated for COVID-19. Wait 2 weeks after getting your second vaccine dose to travel—it takes time for your body to build protection after any vaccination.
- Get tested with a viral test 1-3 days before you travel. Keep a copy of your test results with you during travel in case you are asked for them. Do NOT travel if you test positive.
- Check travel restrictions before you go.
- Bring extra supplies, such as masks and hand sanitizer.
- Avoid touching your eyes, nose, and mouth.

Grading:

Up to 85 points will be awarded for getting the correct solution to the games along with a comprehensive write up that shows how you arrived at your solution. In order to receive points, the methodology, and algorithms behind your solutions must be provided for evaluation.

Up to 15 points will be awarded by a panel of judges for the creativity of the completed or proposed solution and for ideas about the application of AI ethics that might be necessary to use your solution in real-world scenario.

CHALLENGE 3: OPTIMIZING RESOURCES

The ability to correctly allocate medical resources is a valuable tool for promoting the health and safety of Sailors on Navy ships and ashore. This challenge uses time released data about an outbreak of COVID-19 on the USS GHOST, a fictional ship. The USS GHOST is stocked with medical supplies to combat the virus. We want you to develop an algorithm that can correctly allocate medicine, medical equipment, and hospital beds to Sailors if they become ill.

The challenge will evolve over time for a crew of 300 Sailors who are tested daily for COVID-19. If a Sailor tests positive for COVID-19. The ship's hospital corpsman assigns a rate of health decline from -1 to -99

As the scenario progresses, daily reports with the number of Sailors with COVID-19 and the rate of decline in their health will be made available to you. To support the health of the crew, you must allocate resources including ventilators, beds, oxygen tanks, and cutting-edge medical treatments to keep as many crew members healthy as possible.

In a real world outbreak each treatment allocation decision would be made by a qualified medical professional who would take appropriate ethical considerations into account. The purpose of your algorithm is to develop a schedule and recommend treatment that is purely statistically driven.

Challenge 3 Example:

On day one of the challenge you receive a report that shows the following Sailors have become ill with COVID-19. Each sick Sailor will have an ID, health, and rate of health decline.

Sailor ID	Sailor Health	Rate of Health Decline
1	100	-50
2	89	-80
3	24	-59
4	58	-2

You must allocate resources to these Sailors from your bank of resources that includes things like: ventilators, oxygen masks, remdesivir, etc. Each treatment option will raise your Sailor's health.

Your bank of resources could consist of the following:

Item	Quantity	Health Increase
Remdesivir	3	+20 health
Ventilator	2	+55 health
Chloroquine	4	+35 health

You must allocate your Sailors to beds in order to treat them, and then assign treatments to those Sailors.

The health score at the end of each day is calculated by summing health, rate of health decline, and all treatments assigned

If you over-allocate resources to a particular Sailor and push their total health score over 100, it does not contribute to your overall score. A score of 105 and a score of 100 in the health category are both worth a max of 100 points. Be careful to not over allocate and waste resources!

You will submit your answer as a CSV file in the following form:

Sailor ID, Sailor Health, Rate of health decline, Bed, Remdesivir, Ventilator, Chloroquine, Total health at end of day

1, 100, -50, 1, 20, ,35, 100

2, 89, -80, 1, 20, 55, 35, 100

3, 24, -59, 1, , 55, 35, 55

4, 58, -2, , , , ,

The judging criteria for this challenge will include:

Up to 85 points will be awarded for getting the correct solution to the games along with a comprehensive write up that shows how you arrived at your solution. In order to receive points, the methodology, and algorithms behind your solutions must be provided for evaluation.

Up to 15 points will be awarded by a panel of judges for the creativity of the completed or proposed solution and for ideas about the application of AI ethics that might be necessary to use your solution in real-world scenario.

Prize Money Information:

Prizes will be paid by the Navy's HACKtheMACHINE production team at Fathom5. At the close of grading the top teams will be asked to provide additional details in order for Fathom5 to make payments.

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